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FACTORS CONTRIBUTING TO THE LACK OF INFESTATION IN ISOLATED GROUPS OF YELLOW PINE IN THE LOWER SIERRAS.

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JACKSON EXPERIMENT - D. BREVICOMIS

Factors contributing to the lack of infestation in isolated groups of yellow pine in the lower Sierra's, below the yellow pine belt.

Introduction: Small more or less isolated groups or strips of yellow pine usually follow the course of streams for 1000 or more feet below the general lower limit of the yellow pine type. These trees are noticeably free from attack by D.brevicomis even in areas where the main bodies of pine are subject to severe epidemics. This study was planned by Mr. Miller with the belief that a determination of the factors underlying this condition would help answer the old question," why do the bark beetles prefer to attack in certain locations?"

Description of Plot: The site selected is on Whiskey Creek at an elevation of 2100 feet in section 4 T.9 S R.23 E. The plot is about one acre in area in a small flat thru which Whiskey Creek flows. This flat supports a group of about 30 young vigorous yellow pine ranging in diameter from 6 to 22 inches and from 20' to 100' in height. The group is bordered by white and black oak with an understory of willow, alder and live oak.

Purpose: The purpose of the experiment was to determine, so far as possible the importance of the following factors in causing immunity from D. brevicomis attacks in stands of the above type.

1. Susceptibility to attack influenced by:

Isolation
Elevation
Climatic conditions
Nature of the stand.

2. Resistance to attack, influenced by:

Vigor of the trees, as indicated by:

Rate of growth
General appearance of the tree
Crown
Foliage
Bark

Procedure:

1. Susceptibility - On June 3, 1921 a yellow pine 30" in diameter and 130' in height was felled along the creek a short distance above the experimental plot. The purpose of this was to see if D. brevicomis or Ips could be attracted into this area. This trap was examined on July 16 and on December 6, 1921. No D. brevicomis or Ips attacked the tree although D. valens attacked the stump and buprestids breed in the hole of the tree.

Since trap trees in favorable sites even at a distance of two or three miles from the nearest infested tree usually attract D.brevicomis it is probable that the nature or location of the site is such as to discourage the attacks by D.brevicomis. Isolation is not the cause because other trap trees with the same or a greater degree of isolation have been readily attacked. All such trees, however, have been at the same level or at a higher level than the surrounding infestations while in this case the tree was about 1000 feet below the nearest infested area. Two other attempts were made in a nearby location to attract the D.brevicomis below the infested area but these attempts also failed. While these few attempts do not prove anything they indicate that it is difficult or impossible to attract D.brevicomis to a trap any great distance below the level of the surrounding infestation. Temperature may be a factor as the temperature in these low pockets is usually considerably higher than in the true yellow pine type.

It is doubtful if there is anything about the trees themselves which would cause them to be avoided by the beetles as it was possible to induce

attack by "planting" the beetles in this plot.

2. Resistance - To determine the ability of the trees to resist D. brevicomis attacks it was necessary to introduce the beetles since they could not be attracted to the plot. This was done by "planting" yellow pine bark infested with large D. brevicomis larvae around the base of a couple of the trees in the center of the experimental plot. The time of introducing the infested bark, the amount of bark, the emergence from this bark, and the number of attacks made on a living tree in the plot, are given in the following table.

Lot No.	Date Planted	No.Sq.Ft. Planted	Emergence	Total Emergence	No. of attacks on living trees
1	3-22-22	46	9,752*	22,583	492
2	4-17-22	39	12,831*		
3	8-5-22	44	146*	146	30

* Based on count of exit holes on about 25% of the bark.

All of these attacks were made on one tree around which most of the bark had been piled. This tree is 20" in diameter and 80' in height and growing vigorously, as was shown by an increment core taken February 15, 1923. These 522 attacks apparently had no effect on the vitality of the tree as the 1922 and 1923 growth is very good and about the same as that of the other unattacked trees on the plot.

This would indicate that although it might be possible to kill these trees by the introduction of probably hundreds of thousands of beetles it would be impossible to start an epidemic in such a stand because of the

extremely high mortality among the attacking beetles. There is some reason to doubt the possibility of killing a tree on this plot even by the introduction of very large numbers of the beetles since it is evident that only a small percent remain on the area. From the 22,729 beetles which emerged only 522 attacks could be found and at the most only about 1000 beetles remained on the area or about 4% of the total.

In the spring of 1923 this experiment was continued by the planting of 22 more square ft. of infested bark and the cutting of another trap. This trap tree was 18" in diameter and 70' in height. Approximately 3000 D. brevicomis adults emerged from this bark and an attack about normal for a small trap was made on the felled tree. About 20' of the butt had a good attack with an emergence of about 40 to the sq. ft. From 20' from the butt to within about 20' of the tip there was a light attack mostly on the lower sides with an average emergence of about 15 to the sq. ft. The total number of beetles that attacked the trap was approximately 500 or about 17% of the 3000 that emerged from the infested bark.

No attack was made on the living trees either by the beetles that emerged from the imported bark or by the beetles that emerged from the trap. About 2000 beetles emerged from the trap, none of which remained on the area.

Summary: Small groups of yellow pine extend along the creek bottoms to points from 1000 to 1500 feet below the true yellow pine type.

Such groups of trees are noticeably free from D. brevicomis infestation.

It is very difficult, if not impossible to attract D. brevicomis from the higher elevations into these stands, which are apparently not

normally susceptible to attack, probably due to the low elevation and the higher temperatures.

Even when the beetles are introduced in large numbers it is impossible to start an infestation in such stands, principally because of the vigor of such trees. It was found from increment borings that the rate of growth in the trees on the experimental plot is from 5 to 30 times as fast as in average trees in infested areas.

The above summary is based on a local and very limited study and should be supplemented by further study in different areas and under different conditions.